CLAIMS

1. An optics housing, comprising:

an enclosure with an interior volume and configured to be substantially sealed against an external atmosphere;

an optical element positioned in the interior volume, the optical element including material having at least one physical characteristic that varies with exposure to at least one constituent of the external atmosphere;

a container coupled to the housing and including a gas-permeable surface; and

a sink material disposed within the container, the sink material having a characteristic of sorbing at least one gas species.

2. The optics housing of claim 1, wherein at least a portion of the gas permeable surface is substantially opaque to optical radiation.

3. The optics housing of claim 2, wherein the portion of the gas-permeable surface that is substantially opaque to light includes a woven mesh material.

4. The optics housing of claim 3, wherein the woven mesh material has mesh pores, the mesh pores having a pore dimension in units of micrometers that is of the order of one.

5. The optics housing of claim 1, wherein the gas-permeable surface material is perforated metal.

6. The optics housing of claim 1, wherein the gas permeable surface material is a porous medium.

7. The optics housing of claim 1, wherein the optical element includes at least one material selected from CLBO, CD*A, LBO, BBO, KDP, KD*P, $LiNbO_3$, CaF_2, and MgF_2.

8. The optics housing of claim 1, wherein the sink material includes at least one material selected from a molecular sieve, silica gel, activated illumina, and activated charcoal.

9. The optics housing of claim 1, wherein the sink material is confined in at least one sub-container.

10. The optics housing of claim 1, wherein the at least one constituent of the external atmosphere includes water vapor.

11. The optica housing of claim 1, wherein the container is coupled to the enclosure to form a protuberance that extends into the interior volume of the enclosure.

12. An optics housing, comprising:

an enclosure with an interior volume, the enclosure adaptable to be substantially sealed against an external atmosphere;

an optical element disposed within the interior volume, wherein the optical element contains material having at least one physical characteristic that varies with exposure to at least one constituent of the external atmosphere;

a container coupled to the enclosure, wherein the container includes a gas-permeable surface area with a ratio of no less than 0.1 to a surface of the container; and

a sink material disposed within the container, wherein the sink material has a characteristic of spontaneously sorbing at least one gas species.

13. The optics housing of claim 12, wherein the ratio of the gas permeable surface area to an interior surface area of the container is no less than about 0.3.

14. An optics housing, comprising:

an enclosure with an interior volume area, the enclosure adaptable to be substantially sealed against an external atmosphere;

an optical element disposed within the interior volume, wherein the optical element contains material having at least one physical characteristic that varies with exposure to at least one constituent of the external atmosphere;

a container having a gas-permeable surface and a gas impermeable access port to a container interior, the container coupled to the housing so to form a protuberance that extends into an interior volume of the housing with the gas impermeable access port being a portion of an optics housing exterior; and

a sink material disposed within the container, wherein the sink material has a characteristic of sorbing at least one gas species.

15. The optics housing of claim 14, wherein the access port includes an observation window.

16. The optics housing of claim 15, wherein the observation window includes a spectral filter.

17. A laser system, comprising:

a laser;

an enclosure adaptable to be substantially sealed against an external atmosphere and is configurable to receive a laser beam from the laser and emit optical radiation as an output;

an optical element disposed within an interior volume of the enclosure, wherein the optical element contains material having at least one physical characteristic that varies with exposure to at least one constituent of the external atmosphere;

a container having a gas-permeable surface and coupled to the enclosure; and

a sink material disposed within the container, wherein the sink material has a characteristic of spontaneously absorbing of at least one gas species.

18. The laser system of claim 17, wherein the laser system generates ultraviolet radiation.

19. The laser system of claim 17, wherein the laser system generates radiation that overlaps in wavelength with transitions contained in the set of transition selected from electronic transitions of H_2O and rotation-vibration transitions of H_2O.

20. The laser system of claim 17, wherein at least a portion of the gas permeable surface is substantially opaque to optical radiation.

21. The laser system of claim 17, wherein the gas-permeable surface is a woven mesh that is substantially opaque to light.

22. The laser system of claim 17, wherein the optical element includes at least one material contained in the set of materials selected from CLBO, CD*A, LBO, BBO, KDP, KD*P, $LiNbO_3$, CaF_2, and MgF_2.

23. The laser system of claim 17, wherein the sink material includes at least one material contained in the set of materials selected from a molecular sieve, silica gel, activated illumina, and activated charcoal.

24. An optics housing, comprising:

an enclosure with an interior volume and an interior surface area, the enclosure adaptable to be substantially sealed against an external atmosphere;

an optical element disposed within the interior volume, wherein the optical element contains material having at least one physical characteristic that varies with exposure to at least one constituent of the external atmosphere; and

a sink material within the interior volume, the sink material having a characteristic of spontaneously absorbing of at least one gas species.

25. The optics housing of claim 24, further including an isolator member for isolating the sink material from optical power density.

26. The optics housing of claim 24, wherein the optical element includes at least one material contained in the set of materials selected from CLBO, CD*A, LBO, BBO, KDP, KD*P, $LiNbO_3$, CaF_2, and MgF_2.

27. The laser system of claim 24, wherein the sink material includes at least one material contained in the set of materials selected from a molecular sieve, silica gel, activated illumina, and activated charcoal.

28. A laser system, comprising:

an enclosure with an interior volume and an interior surface area, the enclosure adaptable to be substantially sealed against an external atmosphere;

a laser positioned in the interior volume;

an optical element disposed within the interior volume, wherein the optical element contains material having at least one physical characteristic that varies with exposure to at least one constituent of the external atmosphere; and

a sink material within the interior volume, the sink material having a characteristic of spontaneously absorbing of at least one gas species.

29. The laser system of claim 28, wherein the laser system generates ultraviolet radiation.

30. The laser system of claim 28, wherein the laser system generates radiation at a wavelength that is strongly absorbed in H_2O.

31. The laser system of claim 28, wherein the optical element includes at least one material contained in the set of materials selected from CLBO, CD*A, LBO, BBO, KDP, KD*P, $LiNbO_3$, CaF_2, and MgF_2.

32. The laser system of claim 28, wherein the sink material includes at least one material contained in the set of materials selected from a molecular sieve, silica gel, activated illumina, and activated charcoal.

33. A method for protecting sensitive optical elements *in situ*, comprising:

providing an enclosure with an interior volume, the enclosure adaptable to be substantially sealed against an external atmosphere;

disposing an optical element within the interior volume, the optical element including material having at least one physical or optical characteristic that varies with exposure to at least one constituent of the external atmosphere;

providing sink material coupled to the enclosure; and

trapping at least one gas species in the sink material by a sorption process, wherein the at least one gas species includes at least one constituent of the external atmosphere with which the at least one physical or optical characteristic of the optical element varies.

34. The method of claim 33, further comprising removing the sink material through an access port prior to exposing the optical element to laser radiation.

35. The method of claim 33, further comprising isolating the sink material from optical fluence.

36. The method of claim 33, further comprising mitigating aerosol production by enclosing the sink material in a sub-container.

37. The method of claim 33, further comprising mitigating out-gassing by enclosing the sink material in a sub-container.

38. The method of claim 33, wherein the at least one gas species trapped in the sink material includes H_2O.

39. The method of claim 33, wherein a relative humidity in the interior volume is reduced to less than about 5% in less than 120 min.

40. The method of claim 33, wherein a relative humidity in the interior volume is reduced to less than about 5% in less than 30 min.

41. The method of claim 33, wherein a relative humidity in the interior chamber is maintained to less than 5% for at least 30 days.

42. The method of claim 33, wherein a relative humidity in the interior chamber is maintained to less than 2% for at least 30 days.

43. The method of claim 33, wherein a relative humidity in the interior chamber is maintained to less than 2% for at least 180 days.